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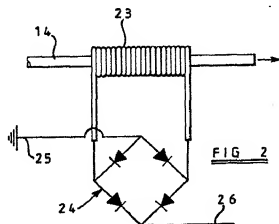
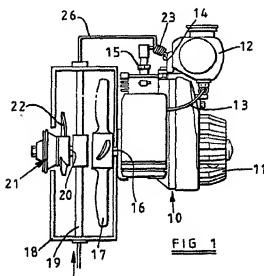
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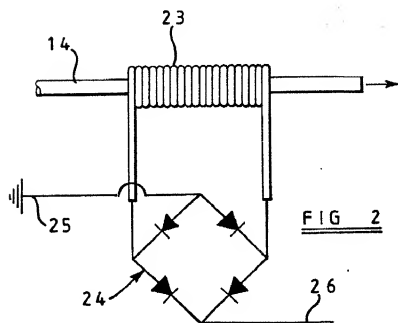
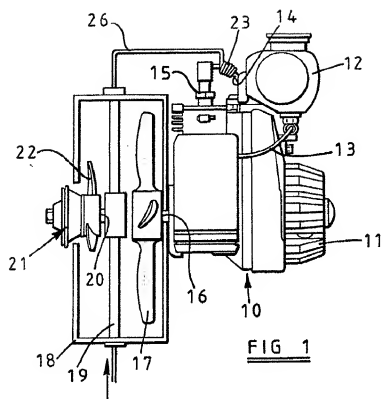
(54) **Voltage generation apparatus**

(57) A 2-stroke petrol engine (10) has a spark ignition system, including a High Tension lead (14) to a spark plug (15), and a winding (23) around part of the lead (14), ends of the winding (23) being connected to a rectifier arrangement (24) from which there is a take off lead (26). When the engine is running, a high voltage is produced in the lead (26), and this is used to charge a liquid feed tube (19) of a rotary atomiser (21), so that atomised spray droplets discharged from the atomiser are electrostatically charged. The atomiser (21) is driven by a fan (17) on a shaft (16) of the engine (10), and is used for crop spraying.



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VOLTAGE GENERATION APPARATUS

This invention relates to apparatus for generating a voltage, and has particular application in the field of agricultural and horticultural spraying.

In spraying crops with insecticide, fungicides and herbicides, it is often desirable to use air assisted sprayers to achieve greater penetration of droplets into the crop canopy and/or to project the droplets further than is possible from purely relying on the throw from a pressure nozzle or the use of a spinning disc atomizer. It has, more recently also become an acknowledged advantage to electrostatically charge the spray droplets to reduce spray drift and/or enhance double sided spray cover of foliage. Previously a solid state battery powered high voltage generator has been used to produce the necessary charge of approximately 4 KV.

An object of the invention is to provide an apparatus for generating voltage in a convenient manner.

According to one aspect of the invention there is provided apparatus for generating a voltage, comprising an engine having a spark ignition system including a high voltage lead connected to a spark plug, and a winding around at least part of the high voltage lead, in which winding a voltage is generated, in use.

Preferably the voltage generated (induced) is fed to a liquid feed shaft of a liquid sprayer so as to produce electrostatically charged spray droplets discharged from the sprayer, in use.

Conveniently the engine is a single cylinder, 2-stroke petrol engine, an output drive shaft of which carries a fan to provide an air blast to carry away liquid atomized by said sprayer. Desirably the fan also drives a propellor to rotate a rotary part of the sprayer.

Advantageously said winding has its ends connected to a rectifier arrangement, which may be in the form of a diode bridge.

The winding preferably consists of 100 - 150 turns of P.T.F.E. insulated 7/0.2 flexible cable. This provides a typical charging voltage of approximately 4 KV from the diode bridge.

The invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic, side view of an apparatus constructed according to the present invention, and

Fig. 2 is a circuit diagram illustrating a rectifier arrangement used with the apparatus.

The voltage generation apparatus shown in Figure 1 includes a single cylinder, 2-stroke petrol engine 10. This is, for example, of the type often used to power a lawn-mower, and has a magneto 11, a petrol tank 12, a petrol feed line 13, a carburettor (not shown) a High Tension (voltage) lead 14 and a spark plug 15. The magneto is operated in the normal way by a pull-rope (not shown) and once the engine is running, it operates conventionally with a high voltage being developed by the engine across the high voltage lead 14 for producing a spark at the spark gap of the plug 15.

Although in this described example of the present invention, the engine is a single cylinder, 2-stroke, petrol engine, any other type of engine could be used provided it has a spark ignition system including a high voltage lead connected to a spark plug. Thus a 4-stroke engine could be used, as could a multi-cylinder engine rather than a single cylinder one. Additionally instead of a magneto a conventional ignition coil could be used to provide the high tension across the lead 14. The fuel for the engine could of course be a substance other than petrol.

As shown in Figure 1 an output drive shaft 16 of the engine is fitted with a fan 17 to provide an air blast, for a reason to be disclosed, when the engine is operating.

The engine carries a casing 18 in which the fan 17 rotates, and in front of the fan 17 there is disposed a vertically extending liquid feed tube 19 which is secured to the top and bottom of the casing. The feed tube 19 has a right angled branch 20 extending away from the fan 17 and disposed substantially co-axially with the shaft 16. Carried on the stationary tube 20 is a rotary atomizer part 21, which with the feed tube forms a liquid sprayer. This rotary atomizer part can be, for example, of the form shown in UK patent number 2118866B, having a propeller 22 nearest the fan 17, so that, in use, the air blast provided by the fan carries away the atomized liquid and at the same time drives the propeller at the rear of the rotary atomizer. The front part of the atomizer projects through an opening at the front of the casing 18. A typical air fan speed would be 4500 r.p.m. and a typical atomizer speed would be 15,000 r.p.m.

As mentioned, the performance and effectiveness of a sprayer can be enhanced if the droplets discharged from the sprayer are electrostatically charged. To this end, therefore, the apparatus shown in claim 1 includes means for electrostatically charging the rotary atomized spray droplets as they leave the spinning disc of the rotary atomizer of the sprayer.

It has surprisingly been found that the necessary voltage can be produced by winding approximately 100 to 150 turns of P.T.F.E. insulated flexible 7/0.2 cable around the lead 14 in the form of a coil 23. Although omitted from Figure 1 for the sake of clarity, Figure 2 shows that the ends of the coil 23 are connected to a rectifier arrangement in the form of a diode bridge 24, which has one earth connection at 25 and a take off voltage lead 26 which is fed to the liquid feed shaft 19 as schematically shown in Figure 1. Thus when the engine is running a voltage of 4 KV (either positive or negative) can be tapped off and used as the high voltage required for charging of the atomized spray droplets. Thus in this particular example, the engine generated high voltage of the spark plug lead is used to induce in a coil another high voltage which, when suitably rectified, can be used in electrostatically charging spray droplets, without the need for any other external power source such as batteries, solar power etc.

Although described in relation to an electrostatic sprayer, it will be appreciated that the invention has uses other than with sprayers, being useful in any application where it is desirable to dispense with other external power sources but where a high voltage is still required.

It has been found that the spark across the plug gap is not noticeably diminished by the addition of the coil 23 with the induced voltage therein. The voltage supplied from the coil is moreover not merely the result of leakage from the lead 14.

CLAIMS

1. Apparatus for generating a voltage, comprising an engine having a spark ignition system including a high voltage lead connected to a spark plug, and a winding around at least part of the high voltage lead, in which winding a voltage is generated, in use.
2. Apparatus as claimed in claim 1, wherein the winding has its ends connected to a rectifier arrangement.
3. Apparatus as claimed in claim 2, wherein the rectifier arrangement is a diode bridge, from which is provided an earth connection and a take off voltage lead.
4. Apparatus as claimed in any one of claims 1 to 3, wherein the winding comprises 100-150 turns of insulated flexible cable.
5. Apparatus as claimed in any one of claims 1 to 4, wherein the engine is a single cylinder, 2-stroke petrol engine.
6. An electrostatic sprayer comprising apparatus for generating a voltage as claimed in claim 1.
7. An electrostatic sprayer as claimed in claim 6, comprising a rotary atomiser to which liquid is fed, in use, from an electrically conductive feed tube which is charged by way of said voltage generated in the winding.

8. An electrostatic sprayer as claimed in claim 7, wherein the winding has its ends connected to a rectifier arrangement.

9. An electrostatic sprayer as claimed in claim 8, wherein the rectifier arrangement is a diode bridge, from which is provided an earth connection and a take off voltage connection.

10. An electrostatic sprayer as claimed in claim 9, wherein the take off voltage lead is connected to said feed tube.

11. An electrostatic sprayer as claimed in any one of claims 7 to 10, wherein a driven output shaft of the engine carries a fan.

12. An electrostatic sprayer as claimed in claim 11, in which said output shaft extends through the rear of a casing attached to the engine and said fan is disposed in said casing adjacent said rear wall, said feed tube being mounted in said casing in front of said fan and having a branch carrying said rotary atomiser, a front part of which atomiser extends through an opening at the front of the casing.

13. An electrostatic sprayer as claimed in claim 12, wherein said output shaft and said liquid feed tube branch are co-axial, and said rotary atomiser includes a propeller carried on said branch and driven, in use, by the air blast provided by said fan.

14. An electrostatic sprayer as claimed in any one of claims 6 to 13, wherein the winding comprises 100-150 turns of insulated flexible cable.

15. An electrostatic sprayer as claimed in any one of claims 6 to 14, wherein the engine is a single cylinder, 2-stroke petrol engine.

16. Apparatus for generating a high voltage substantially as hereinbefore described, with reference to, and as shown in the accompanying drawings.

17. An electrostatic sprayer substantially as hereinbefore described, with reference to, and as shown in Figure 1 of the accompanying drawings.